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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/561,206	12/19/2005	Alan Howard Greenaway	WFS 034	3906
20/987 7590 08/01/2008 VOLENTINE & WHITT PLLC ONE FREEDOM SQUARE 11951 FREEDOM DRIVE SUITE 1260 RESTON, VA 20190				
EXAMINER TURNER, SAMUEL A				
ART UNIT		PAPER NUMBER		
2877				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/561,206

**Applicant(s)**

GREENAWAY ET AL.

**Examiner**

SAMUEL A. TURNER

**Art Unit**

2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 30 April 2008.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1, 2, 4-19 and 27-33 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1, 2, 4-19 and 27-33 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 19 December 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO/SB08)  
Paper No(s)/Mail Date \_\_\_\_\_  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Preliminary Amendment***

The preliminary amendments filed 19 December 2005 and 30 April 2008 have been entered.

### ***Information Disclosure Statement***

The references cited in the international search report of PCT/GB04/002657 and the articles listed under References in the specification fail to comply with the provisions of 37 CFR § 1.97, 1.98 and MPEP § 609. The documents have not been listed in an Information Disclosure Statement in compliance with 37 CFR § 1.98(a). It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

### ***Abstract***

The abstract of the disclosure is objected to because the abstract must be limited to single paragraph on a separate sheet within the range of 50 to 150 words, and because the form and legal phraseology often used in patent claims, such as

"means" and "said," must be avoided. Correction is required. See MPEP § 608.01(b).

***Drawings***

The drawings are objected to because:

in figure 1a reference numeral 9, referenced in the specification, is not shown;

in figure 1b reference numeral 11, referenced in the specification, is not shown;

in figures 5 and 6 the reference numeral 47 does not appear in the specification;

in figures 7 and 8 the reference numerals 63, 65, 67, 69, and 71 do not appear in the specification;

figures 10(a)(i) to 10(a)(iii) must be labeled as "prior art"; and

figure 11(a) must be labeled as "prior art".

See MPEP § 608.02. Corrected drawing sheets in compliance with 37 CFR § 1.121(d) are required in reply to the Office action to avoid abandonment of the application.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the subject matter of claim 18 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

### **Replacement Drawing Sheets**

Drawing changes must be made by presenting replacement sheets which incorporate the desired changes and which comply with 37 CFR 1.84. An explanation of the changes made must be presented either in the drawing amendments section, or remarks, section of the amendment paper. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). A replacement sheet must include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of the amended drawing(s) must not be labeled as "amended." If the changes to the drawing figure(s) are not accepted by the examiner, applicant will be notified of any required corrective action in the next Office action. No further drawing submission will be required, unless applicant is notified.

Identifying indicia, if provided, should include the title of the invention, inventor's name, and application number, or docket number (if any) if an application number has not been assigned to the application. If this information is provided, it must be placed on the front of each sheet and within the top margin.

### **Annotated Drawing Sheets**

A marked-up copy of any amended drawing figure, including annotations indicating the changes made, may be submitted or required by the examiner. The annotated drawing sheet(s) must be clearly labeled as "Annotated Sheet" and must be presented in the amendment or remarks section that explains the change(s) to the drawings.

### **Timing of Corrections**

Applicant is required to submit acceptable corrected drawings within the time period set in the Office action. See 37 CFR 1.85(a). Failure to take corrective action within the set period will result in ABANDONMENT of the application.

If corrected drawings are required in a Notice of Allowability (PTOL-37), the new drawings MUST be filed within the THREE MONTH shortened statutory period set for reply in the "Notice of Allowability." Extensions of time may NOT be obtained under the provisions of 37 CFR 1.136 for filing the corrected drawings after the mailing of a Notice of Allowability.

### ***Specification***

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

### ***Arrangement of the Specification***

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

- (a) TITLE OF THE INVENTION.
- (b) CROSS-REFERENCE TO RELATED APPLICATIONS.
- (c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
- (d) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC (See 37 CFR 1.52(e)(5) and MPEP 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)), and tables having more than 50 pages of text are permitted to be submitted on compact discs.) or REFERENCE TO A "MICROFICHE APPENDIX" (See MPEP § 608.05(a). "Microfiche Appendices" were accepted by the Office until March 1, 2001.)
- (e) BACKGROUND OF THE INVENTION.
  - (1) Field of the Invention.
  - (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
- (f) BRIEF SUMMARY OF THE INVENTION.
- (g) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
- (h) DETAILED DESCRIPTION OF THE INVENTION.
- (i) CLAIM OR CLAIMS (commencing on a separate sheet).
- (j) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
- (k) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

The specification is objected to because the brief summary of the invention includes subject matter which belongs in the detailed description of the invention or the background of the invention, or is a mere repetition of the claims. The subject

matter of the invention should be described in one or more clear, concise sentences or paragraphs. While the brief summary of the invention must be commensurate with the scope of the claims, a mere repetition of the claims fails to provide a summary of the inventions nature and substance. M.P.E.P. 608.01(d) sets forth the basis for the requirement: a properly written brief description of the invention sets out the exact nature, operation, and purpose of the invention, and will be of material assistance in aiding ready understanding of the patent in future searches. The brief summary should be more than a mere statement of the objects of the invention, which statement is also permissible, see 37 CFR § 1.73. Appropriate correction is required.

The specification is objected to because the brief description of the drawings fails to provide a description of the actual drawing, not a mere statement of prior art or invention. The statement "according to one embodiment" is an indication of the number of embodiments, not a description of actual subject matter. See MPEP 608.01(f). Appropriate correction is required.

The disclosure is objected to because of the following informalities: On page 17, line 24 reference numeral 27 should be 25 to correspond to the figure 3. On page 21, line 6 the drawing 9d is referenced as 9c. On page 22 the word gravity should be grating. Appropriate correction is required.

***Claim Objections***

Claims 2, 6, 8, 10, and 11 are objected to under 37 CFR 1.75(c).

In claim 2 there is no antecedent basis for “the aberrating means”. Claim 1 provides antecedent basis for an ‘aberration means’.

In claims 6 and 8 the phrase “the calculation means” should be ‘a calculation means’.

In claim 10 there is no antecedent basis for “aberration function”. Claim 1 provides antecedent basis for a ‘filter function’. Further, the phrase “the signal generated” should be ‘a signal generated’.

In claim 11 there is no antecedent basis for “the complex conjugate aberration functions”. Claim 2 provides antecedent basis for a pair of complex conjugate filter functions.

***Claim Rejections - 35 USC § 112, second paragraph***

The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 2, 4-19, and 27-33 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1 there is no connection between the aberration means which is configured to produce first and second output radiation signals and the detecting



means which is capable of detecting the intensity of incident radiation, the omission of a connection amounting to a gap between the elements. See MPEP § 2172.01. The omission of any connection is emphasized in claims 6 and 8 where the calculating means generates a difference between the first and second output radiation signals. The output radiation signals never reach the detecting means. Claims 2, 4-18, 30 and 31 are dependent from claim 1 and therefor are also included in the rejection.

In claim 2 the aberrating means creates two filter functions which appears to conflict with claim 1 where the aberration means is defined by a filter function.

In claim 4 there us no relationship between the modulator and the structure of claim 1 amounting to a gap between the elements. The relationship is first found in claim 9.

In claim 19 the relationship between the steps is confusing. There is no connection between the input radiation transmitted though the aberration means and the radiation which is incident on a surface. The aberration means also generates first and second output radiation signals. These signals, when combined, somehow provide data from the output device. There is no connection between the output device and the first and second output radiation signals. The output device provides a measure of the intensity of light which is incident on a surface.

In claim 27 there is no connection between the aberration means which is configured to produce first and second output radiation signals and the detecting

means which is capable of detecting the intensity of incident radiation, the omission of a connection amounting to a gap between the elements. The first and second output radiation signals, when combined, somehow provide data from the output device. There is no connection between the output device and the first and second output radiation signals. The output device is coupled to the detecting means which never receives the first and second output radiation signals. Claims 28 and 29 are dependent from claim 27 and therefor are also included in the rejection.

In claim 30 there is no connection between the output device and the first and second output radiation signals. The output device is coupled to the detecting means which never receives the first and second output radiation signals.

In claim 32 there is no connection between the aberration means which is configured to produce first and second output radiation signals and the detecting means which is capable of detecting the intensity of incident radiation, the omission of a connection amounting to a gap between the elements. Claim 33 is dependent from claim 32 and therefor is also included in the rejection.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 1, 2, 4-14, 16, 17, 19, and 27-33 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Neil et al(WO 00/17612).

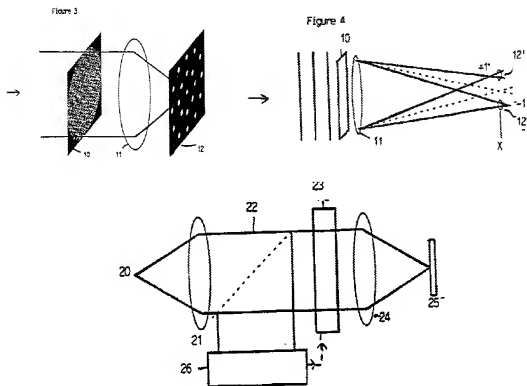


Figure 12

With regard to claim 1, Neil et al teach a measuring apparatus for determining data relating to the shape of an input radiation wavefront, the wavefront shape being describable at a pre-determined location in an optical system(Figs: 3, 4, 12), the apparatus comprising:

aberration means, the shape of which is defined by a filter function that is a complex valued and has non-mixed symmetry(Fig 4, 10; page 9, lines 16-26);

detection means having a radiation sensitive surface capable of detecting the intensity of incident radiation on the surface, the detection means being coupled to an output device that provides a measure of the intensity of the incident radiation(Fig 4; 12',12": page 3, lines 26-31):

wherein the aberration means is configured to act on an input wavefront shape to produce first and second output radiation signals(Fig 4; the +1 and -1 diffraction orders).

As to claim 2/1, Neil et al teach wherein the aberrating means creates at least two filter functions, the filter functions being a complex conjugate pair(page 11, lines 9-19).

As to claim 4/1, Neil et al teach a wavefront modulator(Fig 12, 23; and page 13, lines 19-24).

As to claim 5/4, Neil et al teach wherein the wavefront modulator is configured to transform a wavefront being describable by means of a complex function into a wavefront being describable by a real function(page 13, lines 19-24).

As to claim 6/1, Neil et al teach wherein the output device is provided with the calculation means for calculating a difference between the first and second radiation signals(page 6, lines 14-20).

As to claim 7/1, Neil et al teach wherein the radiation sensitive surface of the detection means is provided with elements that allow the measurement of radiation

intensity at different points across the surface of the detection means(page 3, lines 26-31).

As to claim 8/6, Neil et al teach wherein the output device is provided with the calculation means for calculating the difference between the first and second radiation signals at different points across the surface of the detection means(page 5, lines 26-29).

As to claim 9/4 Neil et al teach wherein the wavefront modulator is coupled to the output device such that the wavefront modulator is distorted to provide a correction to a non-planar input radiation wavefront(page 14, line 19- page 15, line 4).

As to claim 10/1 Neil et al teach wherein the aberration function is a weighted sum of Zernike polynomials arranged to equalize the signal generated from each mode of deformation in the input wavefront according to the expected statistical distribution of such modes in the input wavefront(page 11, lines 9-27).

As to claim 11/1, Neil et al teach wherein the aberration means is arranged such that the complex conjugate aberration functions of the aberration means are associated with diffraction orders of the same order but having different signs(page 11, lines 9-27).

As to claim 12/1, Neil et al teach wherein the first and second output radiation signals are produced simultaneously(page 11, lines 9-27).

As to claim 13/1, Neil et al teach wherein the first and second output radiation signals are produced sequentially(page 3, lines 16-17).

As to claim 14/1, Neil et al teach wherein the aberration means is a diffractive optical element(page 3, lines 4-15).

As to claim 16/1, Neil et al teach wherein the aberration means is a variable refractive index device(page 13, lines 18-24).

As to claim 17/16, Neil et al teach wherein the variable refractive index device is a liquid crystal phase modulator used sequentially to provide complex conjugate aberrations(page 13, lines 18-24).

With regard to claim 19, Neil et al teach a method for determining data relating to the shape of an input radiation wavefront, the wavefront shape being describable at a pre-determined location in an optical system, the method comprising:

transmitting said input radiation wavefront through an aberration means, the shape of which is defined by a filter function that is a complex valued and has non-mixed symmetry(page 9, lines 16-26);

detecting the intensity of incident radiation on a surface(page 5, lines 26-29);  
and

sending the detected intensity to an output device that provides a measure of the intensity of the incident radiation(page 3, lines 26-31);

wherein the aberration means acts on any input wavefront shape to produce first and second output radiation signals that in combination provide data from the output device (page 3, lines 26-31).

With regard to claim 27, Neil et al teach a measuring apparatus for determining data relating to the shape of an input radiation wavefront, the wavefront shape being describable at a pre-determined location in optical system (Fig's: 3, 4, 12), the apparatus comprising:

aberration means, the shape of which is defined by a filter function that is a complex valued and has non-mixed symmetry (Fig 4, 10; page 9, lines 16-26);

detection means having a radiation sensitive surface capable of detecting the intensity of incident radiation on the surface (Fig 4; 12', 12"; page 5, lines 26-29); and

an output device coupled to an output of the detection means (page 3, lines 26-31);

herein the aberration means is configured to act on an input wavefront shape to produce first and second output radiation signals that in combination produce an output signal from the output device (page 6, lines 14-20).

As to claim 28/27, Neil et al teach a wavefront modulator coupled to the output signal of the output device to modulate the input radiation wavefront in response thereto (page 14, line 19- page 15, line 4).

As to claim 29/27, Neil et al teach wherein the output signal from the output device indicates an extent to which the wavefront shape is non-planar, and wherein

when the wavefront shape is planar, the output signal is substantially zero (page 6, lines 14-20).

As to claim 30/1, Neil et al teach wherein the first and second output radiation signals, in combination, provide data from the output device on an extent to which the wavefront shape is non-planar (page 6, lines 14-20).

As to claim 31/1 Neil et al teach wherein the filter function is non-quadratic (page 9, lines 16-26).

With regard to claim 32, Neil et al teach a measuring apparatus for determining data relating to the shape of an input radiation wavefront, the wavefront shape being describable at a pre-determined location in an optical system (Fig's: 3, 4, 12), the apparatus comprising:

aberration means, the shape of which is defined by a filter function (Fig 4, 10; page 9, lines 16-26);

detection means having a radiation sensitive surface capable of detecting the intensity of incident radiation on the surface, the detection means being coupled to an output device that provides a measure of the intensity of the incident radiation (Fig 4; 12', 12"; page 3, lines 26-31);

wherein the aberration means is configured to act on an input wavefront to produce first and second output radiation signals (Fig 4; the +1 and -1 diffraction orders), and



wherein the filter function comprises a real part and an imaginary part, the real and imaginary parts both having even symmetry or both having odd symmetry (page 9, lines 16-26).

As to claim 33/32 Neil et al teach wherein the filter function is complex valued and has non-mixed symmetry (page 9, lines 16-26).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR § 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. § 103(c) and potential 35 U.S.C. § 102(e), (f) or (g) prior art under 35 U.S.C. § 103(a).

Claims 15 and 18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Neil et al (WO00/17612) in view of Greenawat et al (WO99/46768).

As to claim 15/1, Neil et al **fail to teach** wherein the aberration means is a variable-shape optical mirror.

As to claim 18/2, Neil et al **fail to teach** wherein the aberration means is a deformed reflective surface where the illumination of that surface from each side produces the complex conjugate aberration functions.

## **CLAIMS 15 and 18:**

Neil et al teaches a variable-shape aberration means(page 13, lines 18-24) but fails to teach one that is reflective. Greenaway et al teach that the diffractive optical element can be reflective(page 4, line 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Neil et al by replacing the transmissive spatial light modulator(SLM) with a reflective spatial light modulator(SLM).

The motivation for this modification is that the reflective and transmissive spatial light modulators are functionally equivalent. Substituting one known arrangement for another is obvious when it does no more than yield predictable results, see KSR v. Teleflex 82 USPQ2d 1385 (U.S. 2007).

### ***Relevant Prior Art***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kwon(4,653,921), see figure 3; Ulichet al(5,120,128), see figure 3; Chen et al(5,426,521), see figure 1; Tumbar et al(6,639,683), see figures 7a and 7b; Blanchard et al(A.O. 12/2000), see figures 1 and 2; Naumov et al(SPIE 3/1996), see figure 1; and Chang et al(SPIE 2002), see figures 2 and 3.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samuel A. Turner whose phone number is 571-272-2432.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached on 571-272-2800 ext. 77.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Samuel A. Turner/  
Primary Examiner  
Art Unit 2877